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## Amazon, Google, and Apple: Smart Speakers and the Battle for the Connected Home

*The stakes are enormous. The race for voice assistants is the race to be the next ubiquitous interface.<sup>1</sup>*

– Wired Magazine

*The connected home could represent one of the most significant investment opportunities over the next several years.<sup>2</sup>*

– Manav Patnaik, analyst at Barclays

*For the last 60 years, humans were adapting to the computer. The next 60 years the computer will adapt to us. It will be our voices that will lead the way; it will be a revolution, and it will change everything.<sup>3</sup>*

– Brian Rommele, Editor-and-Chief, Multiplex Magazine

Dozens of technology journalists waited in anticipation at Amazon’s headquarters in Seattle, Washington. It was September 2017, and the e-commerce giant had summoned the reporters to the building. Amazon had kept the purpose of the event a tightly guarded secret. At the front of the auditorium, an Amazon executive welcomed the visitors. Ending the suspense, he revealed that Amazon planned to launch a new version of its popular Echo smart speaker, which was powered by an intelligent assistant named Alexa. “Three years ago, we introduced the first Echo with a goal to fundamentally simplify and improve the way customers interact with their homes. Alexa can make calls, play music in every room, turn on your lights, and even order you a pizza... Today we’re making Echo and Alexa even better,” said the executive.<sup>4</sup> The team at Amazon also unveiled the Echo Plus. The device would function as a smart home hub and let consumers manage their connected home devices. After the initial Echo had been a success, Amazon had expanded its portfolio of connected speakers. The company now had a 70% share of the smart speaker market.<sup>5</sup> However, observers wondered if Amazon would continue to dominate the space due to its lack of a smartphone offering and disadvantages in critical technologies.<sup>6,7</sup>

As the event unfolded, executives at Google huddled around their computers to track the latest developments from Amazon. The search giant had introduced its own smart speaker called Google

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Home in 2016 and now claimed almost 25% of the market. The company planned to leverage its strengths in artificial intelligence along with its Android operating system to catch up to Amazon. Although some authorities on the technology space wondered if the rise of smart speakers and voice computing might impact Google's existing advertising business.

The senior management at Apple was also keeping tabs on Amazon's announcement. Apple had recently revealed its connected speaker named the HomePod, but the device would not launch until the end of the year. Apple had become the most valuable company on the planet by building hardware that consumers loved. Company executives hoped history would repeat itself with the HomePod. One expert noted that Apple, "Clearly recognizes that the home is the next frontier on which the consumer electronics battle will be waged."<sup>8</sup> Some critics felt that Apple had deficiencies in cloud computing and artificial intelligence. The lack of competence in those areas could hamper Apple's connected home efforts.<sup>9</sup>

"Connected speakers are part of a broader white-hot market for connected home devices. All of these companies want consumers to use their respective technology to control connected gadgets, from smart lights and thermostats to audio-video gear," explained one publication.<sup>10</sup> An analyst summed up the competition between Amazon, Google, and Apple, "It's so tempting to see everyone's hardware efforts as basically the same, but these companies have very different business models."<sup>11</sup> Executives at all three organizations had significant questions to answer as they fought over the future of the connected home. Which of these firms would succeed? What was the best strategy for each company moving forward?

## Connected Home Industry

By 2017, a wide range of smart products were available for the home (see **Exhibit 1**). These products linked to the internet and consumers could remotely operate and monitor them.<sup>12</sup> Examples of these devices included smart thermometers, connected lightbulbs, and smart televisions. The US connected home industry had experienced slow growth since 2012. Despite the lethargic gains, industry experts felt that the domestic market had significant promise and had started to enter the mass market phase of adoption. A leading research firm estimated that connected home sales worldwide would be \$83 billion in 2017 and that by 2022 that number would increase to \$195 billion. Thirty-nine million connected home devices were installed in US households in 2017. That figure was predicted to rise to 73 million in 2022.<sup>13</sup>

The connected home of 2017 was fundamentally populated by individual solutions. For instance, if a user wanted to operate their smart lighting system, they had to use an application. A majority of these applications were located on tablets or smartphones. If that consumer wanted to use a different smart product, such as their security system or connected dishwasher, then they had to use a separate application. As consumers added more connected items to their home, controlling all their various smart devices through separate applications became a burden, which made future connected home purchases less likely.<sup>14</sup>

Connected products did not typically interact well with other smart devices. No single standard existed for connecting home automation products.<sup>15</sup> Not all devices utilized Wi-Fi because it consumed too much power and Bluetooth had a limited range. Some manufacturers used communication protocols like ZigBee and Z-Wave in their smart home devices due to their low power requirements. A journalist explained, "Many smart home products come with hubs, which are essentially middlemen devices placed between your various smart home accessories and your home's Wi-Fi. Contrary to what you might think, many connected home devices don't connect directly to your Wi-Fi, instead they

connect to their hub using a protocol like ZigBee or Z-Wave, and then that hub is what communicates with your home network.”<sup>16</sup> Vendors such as Samsung and retailer Lowe's sold these smart home hubs to simplify the connected home ecosystem.<sup>17</sup> The journalist noted another advantage of the alternative protocols. “ZigBee and Z-Wave use mesh networking, which means that every smart home accessory can act as a signal repeater of sorts. For example, if you have Philips Hue lights set up in a large house, not every single bulb may be in range of the hub. If a bulb is too far away from the hub, it'll connect to a nearby bulb instead, which in turn connects to the hub.”<sup>18</sup>

## Intelligent Assistants

Intelligent assistants were computer software programs that could comprehend spoken language requests from humans and then react to those commands by completing an assortment of tasks. For example, when prompted via human speech, they could operate lights in a connected home, offer up a weather forecast, or answer a general knowledge question.<sup>19</sup> The first intelligent assistant of significance was Apple's Siri, which the technology company launched in October 2011 by incorporating it into the iPhone 4S and iOS 5.<sup>20,21</sup> Intelligent assistants were also referred to as virtual assistants or voice assistants.

Using an intelligent assistant involved a series of steps that had to be carried out in a matter of seconds. A human invoked the virtual assistant with a “wake word” and then issue a command or question. For example, in the case of Amazon's Alexa, a command might be, “Alexa, turn on the lights.” The assistant within the connected device would take the request and send it to the cloud for analysis. A response was formulated in the cloud and then sent back to the device where the virtual assistant would deliver the response to the consumer.<sup>22</sup>

Several technological advancements had taken place that enabled companies to create and upgrade their intelligent assistants.<sup>23</sup> Improvements occurred in natural language processing, which was the capability of computers to comprehend human speech.<sup>24</sup> Technology firms had also made progress in a type of artificial intelligence called machine learning which was “the practice of teaching machines to learn contextual information based on information they already have access to.”<sup>25</sup> Enhancements in machine learning allowed intelligent assistants to better understand the countless subtleties that existed in spoken language.<sup>26</sup> Upgrades in cloud computing and mobile data networks bolstered the adoption of virtual assistants. Due to faster cellular networks, a user could make a request and receive a response within one to two seconds.<sup>27</sup> By 2017, many technology companies had their own intelligent assistant offerings. In 2012, Google debuted Google Now.<sup>28</sup> The search firm replaced that product in 2016 with an upgraded offering called Google Assistant.<sup>29</sup> E-commerce giant Amazon had Alexa, which it launched in late 2014.<sup>30</sup>

When compared to their expected capabilities in the future, the intelligent assistants of 2017 had rather narrow functionality (see **Exhibit 2** for a list of popular use cases). As one analyst noted, “User experiences with general-purpose virtual personal assistants are often unsatisfying, because the systems can only address a limited set of question-and-answer scenarios.”<sup>31</sup> A top research firm also observed, “Consumer-oriented intelligent assistants require a relatively involved installation and configuration. Consumers are presented with the problem of interfacing each new piece of home automation equipment with the assistant – often a nontrivial task.”<sup>32</sup> Even with the existing restraints, consumers found the products compelling. At least once a month, over 60 million US consumers utilized a virtual assistant like Siri or Alexa.<sup>33</sup>

## Smart Speaker Industry

Amazon introduced the Echo in 2014 (see **Exhibit 3**).<sup>34</sup> Rather than embed its virtual assistant on a smartphone, Amazon installed Alexa in a smart speaker that consumers placed in their homes. Over time the product category flourished. In 2015, consumers spent \$360 million on smart speakers. By 2020, experts forecast total consumer spending on those devices would increase to \$2.1 billion.<sup>35</sup> Amazon had a dominant position in the US smart speaker industry with a 70.6% market share. At 23.8%, Google was a distant second in the market.<sup>36</sup> One analyst estimated that Amazon would sell 10 million smart speakers in 2017. By comparison, the analyst believed that Google would have roughly 2.5 million smart speaker sales over the same timeframe.<sup>37</sup>

In 2017, more and more households were using smart speakers as the nerve center of the connected home. A researcher noted that the devices, "make it easier for consumers to build out their smart home ecosystems and integrate other smart devices into their home environments." By using a smart speaker, consumers could control all of their connected home devices through voice commands to the device.<sup>38</sup>

## The Future of Intelligent Assistants

In the future, virtual assistants would be capable of much more complicated tasks than restaurant reservations and weather forecasts.<sup>39</sup> The intelligent assistants would improve over time due to continued advancements in natural language processing and machine learning.<sup>40</sup> A noted futurist anticipated in five to ten years that artificial intelligence would have abilities approaching that of a human.<sup>41</sup> Virtual assistants would be able to have extended conversations with a human utilizing natural language. The intelligent assistants would even be capable of starting conversations themselves. For example, if a consumer returned home at an unusual time, the virtual assistant in the house would inquire how long the homeowner planned to stay so that the assistant could properly adjust the heat and lights for them.<sup>42</sup>

A top research group forecast that in 2019, 20% of the interactions that consumers had on their smartphones would be conducted through an intelligent assistant.<sup>43</sup> Additionally, the global deployment of consumer-focused virtual assistants would be 1.8 billion by 2021.<sup>44</sup> One analyst wrote, "Since digital voice assistants will touch all parts of life as smart homes and connected cars see increased adoption, consumers will be more likely to stay within a certain ecosystem where their connected devices and voice assistants all work together as seamlessly as possible."<sup>45</sup>

Over time, virtual assistants would not be limited to smartphones and speakers. Assistants would be incorporated into many of the systems that people interacted with on a daily basis such as cars and retail stores. For instance, a shopper would be able to enter their favorite retailer and ask an intelligent assistant embedded in the store where to find the items they wanted. These types of interactions would become common to consumers. A leading research firm estimated that those kinds of services would probably begin to emerge between 2019 to 2022.<sup>46</sup>

A beneficial feedback loop would enhance virtual assistants. Consumers would use the products for relatively simple tasks. Every communication that users had with the voice assistant would contribute to a database of information. The virtual assistant would then use that data to learn about human speech and consumer behavior as well as the individual desires of each consumer. The resulting improvement in the assistant product would drive more user adoption. As those subsequent users utilized the virtual assistant, the product would continue to progress.<sup>47</sup>

## The Rise of Voice

When Amazon launched the Echo in 2014, it changed the nature of the connected home experience. The device was the earliest time that a company made voice the primary focus of the connected home.<sup>48</sup> Authorities on technology believed that the popularity of using voice for computing would grow dramatically over time. The chief scientist from Chinese web giant Baidu projected that by 2020, 50% of US web searches would be voice generated. In 2017, that number was only 10%. Only a few years earlier, the amount of voice web searches had been nominal at best.<sup>49</sup>

In 2016, the voice recognition rate for virtual assistants was 90%. One researcher noted, “Google expects voice assistants to increase their speech recognition rate to 95% by 2020 and 99% soon after, thresholds at which mass consumer adoption and frequent implementation of these voice assistants is anticipated.”<sup>50</sup>

Experts forecast that voice would eventually replace typing as the primary method for humans to interact with computers. They anticipated that the advancement of voice input and intelligent assistants would lead to a decrease in the importance of smartphones in the lives of consumers. Instead, technologies such as augmented reality and connected devices with intelligent assistants embedded in them will eclipse smartphones over time. Smartphones and personal computers would no longer dominate areas such as the connected home, e-commerce, and search.<sup>51</sup>

A leading research group stated that voice-powered intelligent assistants would have a tremendous impact on how humans worked with technology. The firm believed that voice assistant would “drive the next big paradigm shift in information technology.”<sup>52</sup> The research company felt that virtual assistants would, “upend the interaction model from technology-literate people to people-literate technology. This fundamentally changes the relationship between people and technology. Rather than a human adapting to or learning how to use the technology, the technology will adapt to the human.”<sup>53</sup>

## Amazon

### *Amazon Echo*

Amazon debuted the Echo in late 2014. A research firm noted that when Amazon introduced it, the Echo had a narrow set of skills. Months after its launch the Echo could only execute 14 skills, such as setting alarms and playing music.<sup>54,55</sup> Although the device had limited functionality in its early days, one publication explained the importance of the Echo to the company. “Amazon wants a way to own its customer interactions, mainly shopping interactions, without an Apple phone or a Google web browser as an intermediary.”<sup>56</sup>

### *Alexa and Third-Party Skills*

In an attempt to add more skills to their voice assistant, the team at Amazon began to allow third-party developers to build skills for Alexa in June 2015.<sup>57</sup> Steve Rabuchin, vice president of Amazon Alexa, described the strategy, “Let us do what we do best. We open it up and watch the innovation that occurs in collaboration.”<sup>58</sup> By September 2017, Alexa had accumulated 25,000 skills.<sup>59</sup>

Alexa’s wide catalog of skills included the ability to answer questions from the game show Jeopardy, asking medical questions to WebMD, and ordering an Uber ride.<sup>60</sup> Amazon also intended to integrate Alexa with Cortana, which was Microsoft’s voice assistant. This alliance would enable new functionality for Alexa users. For example, an Echo owner would be able to connect to the calendar

and email on their work computer.<sup>61</sup> Microsoft had chosen to focus its voice assistant on office productivity rather than the connected home.<sup>62</sup>

### *Alexa Everywhere*

Access to its skills catalog was not the only aspect of Alexa that Amazon opened to other firms. The company created Alexa voice service, which allowed third-party hardware manufacturers to integrate the voice assistant into their smart devices.<sup>63</sup> Rabuchin explained the choice, “We have this vision of Alexa everywhere. We can’t do it all ourselves. There’s no way we are going to build every smart home device and every wearable.”<sup>64</sup> In some circumstances, Amazon provided monetary incentives to partners to drive the creation of Alexa-enabled third-party devices.<sup>65</sup>

Amazon managed to integrate Alexa into a wide range of connected devices including appliances, cars, and light switches. By January 2017, roughly 250 devices had integrated with Alexa.<sup>66</sup> For instance, Whirlpool planned to integrate Alexa into some of its appliances and Ford intended to use Alexa in certain vehicles.<sup>67,68</sup> Throughout 2017, Amazon continued to maintain its lead in hardware integrations, announcing new partners each month.<sup>69</sup>

### *Expanding the Echo Line of Products*

Amazon continued to add to its portfolio of smart speakers over time. By 2017, Amazon had ten devices in the Echo product line (see **Exhibit 4**). The Amazon Echo Dot, which retailed for \$50, was a low-cost version of the Echo. The product allowed consumers to experience Alexa at a reduced price point<sup>70</sup> (see **Exhibit 5**). The Echo Show had a seven-inch screen and a retail price of \$230 (see **Exhibit 6**). Consumers used the Echo’s screen for a wide variety of tasks including watching YouTube videos, viewing photos, weather updates, or reading music lyrics. By adding a display, Echo Show owners could view product details on potential purchases, which was an issue that constrained voice-only shopping.<sup>71</sup> One survey indicated that only 32% of Echo owners had ever used the device to make a purchase on Amazon Prime.<sup>72</sup>

The company also sold the Amazon Dash Wand, which focused on kitchen usage and ordering groceries (see **Exhibit 7**).<sup>73</sup> Consumers could order food items with their voice, and the retailer would deliver them via Amazon Fresh, which was the company’s grocery business. Amazon had recently expanded its grocery offerings with the purchase of Whole Foods for \$13.7 billion in 2017.<sup>74</sup> The Dash Wand had a barcode scanner so consumers could scan food specific items to order them.<sup>75</sup> The device retailed for \$20. However, once the Dash Wand was registered, Amazon gave the buyer a \$20 discount on their next Amazon purchase, making the product basically free.<sup>76</sup>

Additionally, Amazon launched a subscription music service that was similar to Spotify and Apple Music. By coupling a music offering with a smart speaker, Amazon hoped that consumers would consume music through their Echo using the voice controls on the device rather than listen on their phones.<sup>77</sup>

In September 2017, Amazon debuted the second generation of its Echo speaker at a retail price of \$100.<sup>78</sup> At the same time, the company announced the Echo Plus (see **Exhibit 8**). The device, which was larger than the Echo, acted as a smart hub for the home. This feature meant that the Echo Plus could install and control connected devices in the home. The Echo Plus did not need a corresponding skill or application to set up and operate a smart home device.<sup>79</sup> To connect compatible devices to Alexa, a homeowner could utter, “Alexa, discover devices.” One publication estimated that over 100 devices would work with the Echo Plus at launch.<sup>80</sup> The speaker also contained a ZigBee radio, which allowed

it to communicate directly with connected home devices that utilized the popular protocol. Although, the Echo Plus did not support the commonly used Z-Wave communication protocol.<sup>81</sup>

One publication commented, “Alexa wasn’t really considered a full smart home platform before, but with this new support it’s moving from being a connected speaker to taking on Samsung’s SmartThings, Google’s Nest, and Apple’s HomeKit.”<sup>82</sup> Another magazine noted, “The implication is that Amazon doesn’t want to play a supporting role in smart homes anymore. Instead, it wants a hand in every interaction, even if voice isn’t always involved.” Amazon introduced several features that brought its home automation capabilities up to the level of its competition. For instance, the company enabled a feature called “Routines” that allowed multiple actions to occur simultaneously. A homeowner could utter, “Alexa, Good Morning,” which would turn on the lights, television, and radio at the same time.<sup>83</sup> By April 2017, analysts estimated that more than 9 million homes in the US owned at least one product in the Echo product line.<sup>84</sup> In mid-2017, one research company concluded that over the previous two years Amazon had sold roughly \$1 billion in Echo speakers in the US.<sup>85</sup>

### *Monetization*

Dave Limp, SVP of devices and services at Amazon, described the company’s monetization strategy for its Echo line of products. “What we’re trying to do is build a business model where we sell the hardware side of the products effectively at cost... If customers use it over a period of time, then we’ll take a small amount of profit every time they have a transaction.”<sup>86</sup> Limp noted that Amazon’s device business was, “less about building hardware for customers and more about building services behind that hardware.”<sup>87</sup> Research showed that Amazon customers that purchased an Echo spent 10% more with the retailer than before they owned the smart speaker.<sup>88</sup> One estimate pegged the total voice-purchasing market in 2017 at \$250 million.<sup>89</sup> However, an expert predicted that by 2020, Amazon could potentially drive \$5 billion in sales through the Echo.<sup>90</sup>

Amazon had created numerous private brands of its own with goods such as baby wipes and batteries. An analyst suggested a scenario might arise that if an Echo customer requested baby wipes, the only wipes available for purchase would be from Amazon’s private brand.<sup>91</sup> In addition to facilitating additional purchases on Amazon, the company incorporated data from the Echo into its recommendation engine. That allowed Amazon to display more relevant items to its Echo customers when they shopped online.<sup>92</sup>

### *Smartphone Strategy*

In 2014, Amazon had launched its own mobile handset called the Amazon Fire Phone.<sup>93</sup> The device failed to gain any traction in the market and the company stopped selling the handset in September 2015.<sup>94</sup> A journalist described the Fire Phone as, “perhaps Amazon’s biggest flop ever.”<sup>95</sup> The lack of phone or operating system led *USA Today* to write, “Alexa plays second fiddle to Siri and Google Assistant on the devices that two billion people start and end each day with – their phones.” One analyst remarked, “The biggest weakness Alexa has today is that it’s basically stuck at home.”<sup>96</sup>

Amazon had partnered with several Android manufacturers like HTC and Huawei to integrate Alexa directly into certain handsets as the standard assistant. However, the install bases for those devices were quite small.<sup>97,98</sup> Because of Android’s open ecosystem, OEMs had the option of augmenting the software on their handsets and were not required to make Google Assistant the default solution.<sup>99</sup> Although Samsung, the largest Android handset manufacturer, had no plans to work with Amazon. Instead, Samsung planned to use a virtual assistant it had built internally.<sup>100,101</sup>

Amazon also offered an Alexa mobile application so consumers could access the voice assistant on iOS and Android devices. At the end of September 2017, the Alexa application was around the 200th most popular application those platforms.<sup>102</sup> However, experts felt that the closed ecosystem on the iPhone would make it particularly difficult for Amazon to find success on that handset since Apple would limit certain functionality to its own voice assistant Siri. One research analyst explained, “The challenge for Amazon in circumventing the operating systems is that it’s basically impossible to supplant as the default assistant on iOS.” The analyst also observed that consumers tended to adopt the default solutions that were presented to them.<sup>103</sup>

## Google

### *Google Home*

In November 2016, Google began selling a smart speaker intended to compete with the Amazon Echo. The device, named Google Home, had a retail price of \$129 (see **Exhibit 9**). “We are going to invest a lot in (Google Home) over 2017, I think there is a lot of work ahead to make all of this work well for users. And this is the core area where we’ve invested in for the very long term,” said Google CEO Sundar Pichai.<sup>104</sup>

### *Google Assistant*

The virtual assistant that powered the Google Home speaker was called Google Assistant. The virtual assistant launched in May 2016.<sup>105</sup> The tagline for the product was “All your devices. One assistant.”<sup>106</sup> This slogan could be seen in Google’s distribution strategy of its assistant product. Google Assistant was not restricted to the Google Home speaker. The search giant also deeply integrated Google Assistant into Google Pixel, the company’s leading Android smartphone.<sup>107</sup> Third-party OEMs built most Android handsets, but the Google manufactured the Pixel which allowed the company to have complete control over the smartphone. Additionally, Google Assistant was integrated into Google Allo, the firm’s newest messaging application.<sup>108</sup> Pichai explained, “We expect voice to work from many different contexts. We are thinking about it across phones, homes, TVs, cars, and trying to drive the ecosystem that way, and we want to be there for users when they need it.”<sup>109</sup>

Google Assistant was also the default assistant on Android smartphones not built by Google. However, the product only ran on handsets that utilized newer Android software versions. As of May 2017, 100 million devices had access to the product.<sup>110</sup> This figure paled in comparison to the total number of Android devices worldwide at 1.5 billion.<sup>111</sup> Several publications predicted that Google would incorporate its assistant product into the firm’s other widely used services such as Gmail and Google Maps, in the hopes of giving Assistant a much broader footprint.<sup>112,113</sup> Like Amazon, Google had a mobile application.

In December 2016, Google opened up Assistant to third-party developers so they could create skills for Google Home.<sup>114</sup> By fall 2017, Google Home had 724 available skills, which was far behind the Amazon.<sup>115</sup> Google was also making Assistant accessible through third-party devices through partnerships with manufacturers like Sony and Panasonic.<sup>116,117</sup>

Since Google was a search company and had long invested in machine learning, many experts felt that Google’s artificial intelligence capabilities eclipsed the competition. One publication went so far as to say, “Google Assistant is light-years ahead of Amazon’s Alexa.”<sup>118</sup> Google had a particular advantage in retrieving answers to specific questions. Searching through information and providing consumers with answers was core to Google’s existing business.<sup>119</sup> A marketing agency posed the same

5,000 general knowledge questions to Alexa, Google Assistant, and Siri. Google Assistant was able to correctly answer over 50% of the questions, while Alexa and Siri were correct on just over 20%.<sup>120</sup>

### *Monetization*

Some observers noted that the growth in intelligent assistants and voice computing might affect Google's core advertising business.<sup>121</sup> In Q3 2017, Google generated \$27.8 billion in revenue. Google's advertising business drove 87% percent of that figure through display, search and video ads. One publication explained the firm's challenges, "Google monetizes search through display advertising which doesn't exist in a pure voice-based user interface (i.e. no display)."<sup>122</sup> A journalist elaborated, "Whereas most consumers don't find the text and product listing ads that appear on search result pages to be much of a nuisance, and may indeed find them useful, the same doesn't hold for voice ads they have to listen to after getting a voice reply." He continued, "And if Google deals with this by having a 'paid response' occasionally act as the main reply, it risks damaging both the quality and trustworthiness of its services."<sup>123</sup> Despite the lack of clarity regarding how intelligent assistants would impact Google's business, the search company could use a consumer's interactions with Google Home to serve more personalized ads to that user on other platforms.<sup>124</sup>

In March 2017, the company experimented with advertising on Google Home. When consumers asked Google Home users to give them a rundown of their day, Google mentioned that the new *Beauty and the Beast* film was being released that evening. The ad was pulled down within a few hours after customers protested online.<sup>125,126</sup>

### *Nest*

Google purchased Nest, a home automation equipment manufacturer, for \$3.2 billion in 2014.<sup>127</sup> Nest was initially known for its smart home thermometers. Over time the company had expanded its connected product lineup to include security cameras, doorbells, security systems, and smoke alarms. Nest's thermostat was capable of acting as a smart home hub. The firm had an ecosystem of third-party connected home products that were compatible with its hardware.<sup>128</sup>

### *E-Commerce*

After it launched, Google Home was criticized for not having a strong e-commerce component like Amazon.<sup>129</sup> In February 2017, the company introduced Google Express, which was the firm's shopping service, into Google Home. Customers could purchase items via voice through their Google Home device. Consumers bought those goods through various retailers that had partnered with Google Express, which included Target, Walgreens, and Costco.<sup>130</sup>

In an attempt to compete with Amazon in e-commerce, Google forged an alliance with Walmart in September 2017. Google Home owners could purchase Walmart's full selection of products through Google Assistant. This partnership was a significantly bigger than Google's other retail deals since Walmart sold hundreds of thousands of items online.<sup>131</sup> The partnership with Google marked the first time that Walmart had sold products online not through the Walmart website.<sup>132</sup> Customers could connect their Walmart account to Google Express. When that occurred, Google would receive data on the customer's Walmart purchase history. That information would mostly involve online orders, but in certain circumstances, Google could access the customer's in-store purchase data as well.<sup>133</sup>

## Apple

### *HomePod*

In June 2017, Apple announced a smart speaker product named HomePod. The company intended to start selling the device in December 2017<sup>134</sup> (see **Exhibit 10**). Launching in the US, UK, and Australia, the HomePod would retail for \$349.<sup>135,136</sup> Apple's foray into the connected home represented a major initiative for the company. One analyst explained, "Apple can't afford to yield valuable real estate in the heart of people's homes to Amazon, Google and others as access to content, information and search becomes pervasive and less dependent on the smartphone. As the iPhone reaches a point of near-saturation in mature markets and replacement rates continue to slow, Apple must find new ways to lock in users."<sup>137</sup> Another analyst weighed in, "Two big things Apple has going for it are brand loyalty and seamless product compatibility. There are a lot of consumers who are loyal to the brand and who would love to see uncomplicated integration between iPhone and iPads, Apple TVs and Apple speaker devices."<sup>138</sup> One newspaper observed that although HomePod was a late entrant into the smart speaker market, Apple had taken the same approach in the past. "The iPod and iPhone both entered their respective markets years behind competitors. But their ease of use, elegant design, and superior technology helped corner the markets."<sup>139</sup>

### *Siri*

Apple launched its voice assistant in 2011, which it named Siri.<sup>140</sup> While the assistant was first offered on its iOS operating system, Apple eventually integrated into its other operating systems like macOS, and CarPlay.<sup>141</sup> Despite Apple's early entrance into the voice assistant market, several publications acknowledged problems with Siri. One source explained, "Siri is supposed to be the brains behind HomePod, but Siri has failed to evolve substantially in the six years since it debuted on the iPhone. Amazon's Alexa software and Google Assistant are both perceived to have the edge in terms of handling spoken requests."<sup>142</sup> As another observer remarked, "Siri could really use a shot in the arm."<sup>143</sup> An analyst noted that Siri, "Has been described as 'patchwork' requiring software services from different vendors, which makes it difficult to be as cohesive as Google Assistant."<sup>144</sup>

While the competition had embraced third-party integration with their voice assistants, Apple's approach had been characterized as slow.<sup>145</sup> The tech giant waited until September 2016 before allowing Siri to integrate with third-party applications. Apple restricted that integration to a handful of application categories, which included voice calling, ride-hailing, messaging, payments, fitness, and photo search.<sup>146</sup> When Apple announced the HomePod in mid-2017, it also mentioned that it would open up Siri to a few more applications like note-taking and to-do lists.<sup>147</sup> One venture capitalist remarked that Apple was, "At risk of losing the lead by underestimating the value of third-party apps. That's surprising because Apple invented the App Store."<sup>148</sup>

Analysts believed that over 700 million iPhones were currently in use, compared to 1.5 billion Android devices.<sup>149,150</sup> Although Apple's worldwide market share was not forecasted to increase, Apple typically had over 50% of the market in developed countries.<sup>151</sup> Apple focused on wealthier customers that were likely to consume more digital content. As a result, developers were attracted to Apple's ecosystem because they were able to achieve a better return on investment than on other competing platforms.<sup>152</sup>

While Apple did not have the most popular mobile operating system, the footprint of Apple's voice assistant was larger than its rivals. Siri was available on 800 million Apple devices including the iPhone, iPad, and Apple Watch. Each month almost half of those devices utilized Siri.<sup>153</sup> Unlike Alexa and

Google Assistant, Siri was only accessible through the Apple ecosystem. Apple had not created a mobile application to extend its voice assistant to other platforms.

The Home application also enjoyed a widespread deployment. The company sold over 215 million iPhones in 2016, and all of those phones had the Home application.<sup>154</sup> Some iPhone users had early models of the device such as the iPhone 4. Those consumers would be able to connect to Apple's connected home offerings once they upgraded to a new iPhone.<sup>155</sup>

Siri was available in more languages and countries than the competition. As of June 2017, Siri was accessible in 21 languages in 36 countries.<sup>156</sup> By comparison, seven countries could use Google Assistant. Amazon's Alexa was available in only English and German.<sup>157</sup> Apple also had nearly 500 retail stores, which allowed consumers to interact with connected home products while being assisted by Apple's well-informed sales team.<sup>158,159</sup>

### *HomePod Strategy*

Rather than compete directly with the Echo and Google Home, Apple positioned the HomePod against high-end speaker systems like Sonos or Bose.<sup>160</sup> Apple highlighted the superior sound quality of the device.<sup>161</sup> To ensure its speaker offered high-quality sound, Apple included a custom built woofer, seven tweeters, and echo canceling.<sup>162</sup> The HomePod also had room-sensing technology, which allowed the device to customize its sound depending on where the consumer placed the speaker.<sup>163</sup> One journalist wrote, "Compared to the HomePod, the Echo sounded like someone singing through a tin can a mile away. It's isn't even in the same league."<sup>164</sup>

An expert pointed out, "Apple is smart to frame the HomePod as a music-centric and audio-centric device rather than just another smart speaker or another home for Siri."<sup>165</sup> By concentrating on music, Apple was able to avoid unflattering comparisons to other smart speakers. "Going head-to-head with Google Home's speech recognition or Amazon Echo's voice command developer ecosystem could have been disastrous," said one publication.<sup>166</sup> Secondly, music was an area where the company already had a strong foothold through its Apple Music, iPod, and iTunes offerings.<sup>167</sup>

After seeing the announcement for the HomePod, an analyst wrote, "The presentation focused on how strong the performance of the speaker is, with the smart speaker presented almost as an afterthought. We view the performance focus as an indication that Apple lacks the proprietary services to match up well with in-home smart assistants from Amazon and Google."<sup>168</sup> One journalist explained, "The HomePod shows up Apple's shortcomings in cloud computing and the related fields of machine learning and artificial intelligence."<sup>169</sup> The inclusion of third-party skills was not mentioned, which potentially signified that the HomePod might have a minimal task catalog at launch.<sup>170</sup>

A publication noted, "Regarding the HomePod, developers are kind of hamstrung, still limited to the same capabilities that they were given for Siri on the iPhone. They can build very limited functions for a small amount of apps or features, narrowing the interactive potential for the HomePod." One analyst speculated that the HomePod's restricted ecosystem was a calculated choice by Apple. The analyst argued that, "Apple is very concerned with overwhelming users with a plethora of possibilities." Additionally, Apple reduced the capabilities available to third-parties while simultaneously, "giving itself better development tools than it is for anyone else." For instance, the company, "severely hampered the functions available to Spotify, while making Apple Music much more interactive for developers and users."<sup>171</sup>

### *Home App and HomeKit*

A vital part of Apple's connected home offering was its Home application (see **Exhibit 11**). Announced in 2016, Home was an iOS application that enabled Apple consumers to control all of the smart devices in their connected home through one interface. The application was available to iPhone, Apple Watch, and iPad owners with iOS 10.<sup>172</sup> Like Siri, the Home application was only accessible on Apple devices.<sup>173</sup>

Underpinning the Home app was the HomeKit developer protocol, which allowed compatibility between third-party products and Apple devices.<sup>174</sup> Apple first released HomeKit in 2014, which made the company an early entrant into the connected home market. The debut of the HomePod marked a shift in strategy by Apple. Before the introduction of the smart speaker, Apple had positioned Apple TV and the iPad as the devices that would control the connected home. Instead, HomePod owners would be able to control HomeKit devices through voice commands to their speaker. One journalist noted that Apple, "Seemed to be betting on Wi-Fi and Bluetooth as its wireless protocols of choice. Because iPhone, iPads, and Apple TV boxes already have Wi-Fi and Bluetooth radios inside, they can connect directly to certain HomeKit devices with no additional bridges or hubs."<sup>175</sup>

In the past, manufacturers of home automation products had lamented the difficulties of HomeKit development. To be certified as HomeKit compliant, devices had gone through an extensive compatibility testing process that could last three to five months. Apple had placed restrictions on the factories that manufacturers could select to produce HomeKit compatible products.<sup>176</sup> Manufacturers also needed to include authentication chips in their products that they had to purchase from Apple. In response to those criticisms, Apple loosened its HomeKit certification policies in June 2017. Authentication chips were no longer required, and the testing process was simplified. Even with Apple's changes, one expert commented, "It's still much easier for smart home developers to integrate with smart speakers from Amazon and Google."<sup>177</sup>

### *Monetization*

Apple's monetization strategy for its smart speaker differed from Amazon and Google. While the competition intended to use its speakers to drive software and services revenues, Apple concentrated on generating revenue from sales of the HomePod device. This approach was in keeping with Apple's overall focus on hardware purchases. In Q3 2017, Apple brought in over \$45 billion in total revenue. Eighty-four percent of that number came from selling devices like the iPhone, iPad, and Mac.<sup>178</sup>

### *Privacy*

Apple highlighted its approach to privacy as a differentiator from Google and Amazon. After six months, Apple deleted communications between consumers and Siri. Apple retained a separate copy of those interactions for up to eighteen months, but that data was not linked to the individual customer.<sup>179</sup> By comparison, Amazon and Google held onto user communications unless a customer asked that they be deleted.<sup>180</sup> Apple also required developers to incorporate extensive encryption software into their hardware for the device to be HomeKit compliant.<sup>181</sup> While Apple felt that this approach to privacy would help it stand out from the pack, some experts indicated that restricting the amount of data that it could utilize to train Siri might hamper Apple's ability to improve its voice assistant.<sup>182</sup> However, Apple disputed that idea, "I think it is a false narrative," said Greg Joswiak, Apple's VP of product marketing. He continued, "We're able to deliver a very personalized experience... without treating you as a product that keeps your information and sells it to the highest bidder. That's just not the way we operate."<sup>183</sup>

## Moving Forward

Once Amazon's event ended, the senior management from each firm sat down to discuss strategy. The team at Google pondered if they would be able to catch up to Amazon's dominant market position. How could the search company minimize the threat to its advertising business? The staff at Apple questioned if the company would be able to make up for its late entry into the market. Would Apple's perceived weaknesses in critical technologies lead to failure? The executives at Amazon found themselves wondering if they could overcome the lack of a smartphone offering and deficiencies in artificial intelligence. Which firm would come out on top in smart speakers and the connected home? What was the best strategy for each company to pursue?

**Exhibit 1** Examples of Connected Home Products

**Smart Appliances**

- Connected washer/dryer/dishwasher
- Connected stove/oven
- Connected refrigerator/pantry
- Connected cleaning/vacuum

**Utilities Management**

- Connected thermostat
- Connected lighting
- Connected energy tracking
- Connected lawn sprinklers

**Smart Entertainment**

- Multi-room music
- Seamless audio/video playback
- Room-controlling theater

**Security and Safety**

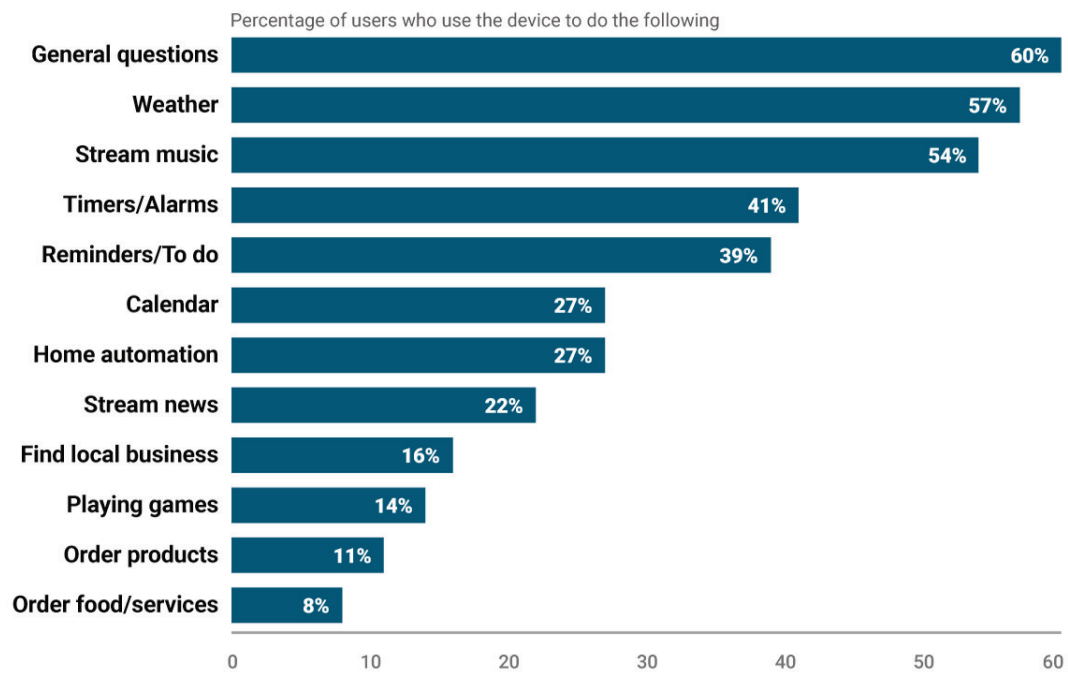
- Connected smoke/CO detector
- Remote video
- Connected lock
- Connected leak detector

**Wellness Monitoring**

- Vitals data uploading
- Connected scale
- Elderly/child activity uploading
- Connected pill case

Source: "The Connected Home Market," McKinsey website, [https://www.mckinsey.com/spcontent/connected\\_homes/pdf/mckinsey\\_connectedhome.pdf](https://www.mckinsey.com/spcontent/connected_homes/pdf/mckinsey_connectedhome.pdf), accessed February 2018.

Exhibit 2 Top Use Cases for Smart Speakers - Q1 2017



Source: Jeff Dunn, "People Mainly Use Smart Speakers for Simple Requests," *Business Insider*, May 30, 2017, <http://www.businessinsider.com/how-people-use-smart-speakers-amazon-echo-chart-2017-5>, accessed February 2018.

Exhibit 3 Amazon Echo



Source: Amazon Media Kit.

Exhibit 4 List of Amazon Echo Devices

	Description	Price	Screen	Launch Date
Echo	The standard Echo with improved sound and six colored fabric/finish options	\$100		November 2014 (Second generation of the device launched in September 2017)
Echo Dot	The cheapest way to add Alexa to a room, but a tiny speaker and no screen	\$50		June 2015
Amazon Tap	A portable Bluetooth enabled speaker	\$100		March 2016
Echo Look	An Echo with a built-in LED-lit camera for full length photos and videos for reviewing your outfits and getting fashion advice from Amazon Style Check	\$200		April 2017 (invitation only)
Echo Show	An Echo with a mid-size screen for video and audio calls, viewing photos and recipes, or monitoring security cameras	\$230	7.0" screen	June 2017
Amazon Dash Wand with Alexa	The device was intended for use in the kitchen so consumers could order groceries.	\$20 (includes \$20 rebate on initial Amazon order)		June 2017
Echo Plus	A bigger Echo with built-in smart home hub that controls devices from 100 different partners	\$150		October 2017 (estimated)
Echo Spot	An alarm clock with a tiny screen for voice and video calls that can connect to bigger speakers	\$130	2.5" screen	December 2017 (estimated)
Echo Connect	A bridge between Echo devices and landline phones so you can take VoIP and traditional calls to your home phone number on your Echos	\$25		December 2017 (estimated)
Echo Buttons	Play games on your Echo using Buttons as controllers that let you buzz in to answer trivia questions	2 for \$20		Holiday 2017 (estimated)

Source: Adapted from "Comparing All Eight Amazon Echos," *TechCrunch*, September 27, 2017, <https://techcrunch.com/2017/09/27/echo-plus-spot-connect-dot-show-look/>, accessed December 2017.

**Exhibit 5** Amazon Echo Dot



Source: Amazon Media Kit.

**Exhibit 6** Amazon Echo Show



Source: Amazon Media Kit.

**Exhibit 7** Amazon Dash Wand



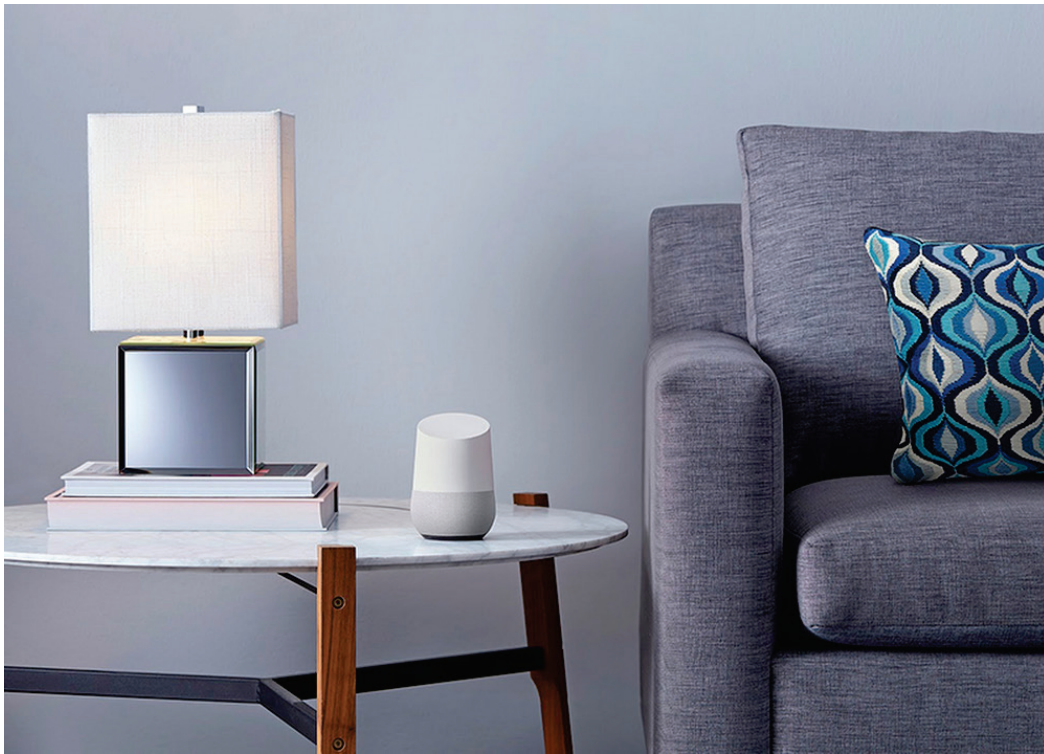
Source: Amazon Media Kit.

**Exhibit 8** Amazon Echo Plus



Source: Amazon Media Kit.

**Exhibit 9** Google Home



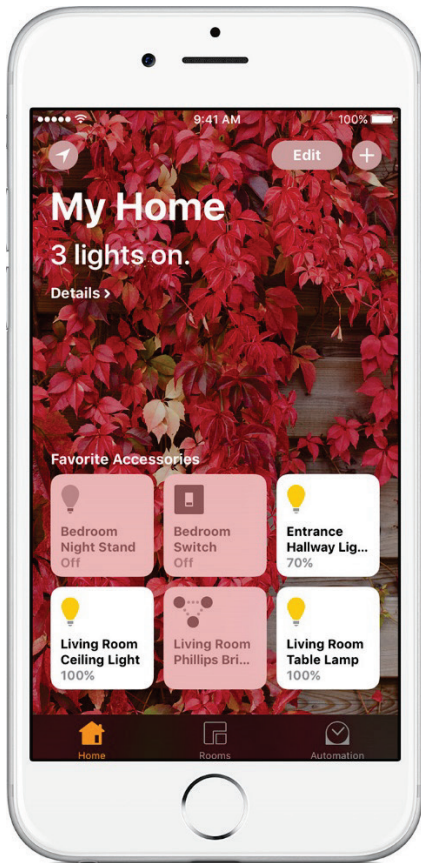
Source: Sundar Pichai, "I/O: Building the Next Evolution of Google," Google website, May 18, 2016, <https://www.blog.google/products/assistant/io-building-next-evolution-of-google/>, accessed February 2018.

**Exhibit 10** Apple HomePod



Source: Apple Media Kit.

Exhibit 11 Apple's Home App - iPhone



Source: Apple Media Kit.

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